USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2006VA105G

Title: Microtopography Effects on Vegetative and Biogeochemical Patterns in Created Wetlands: A Comparative Study to Provide Guidance for Wetland Creation and Restoration

Project Type: Research

Start Date: 09/01/2006

End Date: 08/31/2008

Congressional District: 11

Focus Categories: Wetlands, Ecology, Hydrogeochemistry

Keywords: Microtopography, Wetland Creation and Restoration, Plant Diversity, Soil Nutrients, Wetland Mitigation

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Federal Funds: $58,115

Non-Federal Matching Funds: $58,117

Abstract: Most created or restored wetlands lack microtopography due to the use of heavy machinery for grading during the construction process that reduces or eliminates the microtopographic heterogeneity. Microtopography is a key factor in promoting the development of vegetative structure and composition, and biogeochemical functions in natural wetlands. Most previous studies on the role of microtopography in ecological functions are based on the cases of natural wetlands. Moreover, the microtopographic measurements in those studies were rather descriptive without addressing spatial "scale", on which "micro"-topography is inevitably dependent upon. It is important to recognize the significance of "scale" in designing experiments because ecological phenomena may only be apparent at certain scales. Furthermore, very few data exist on the length of time needed for created or restored wetlands to develop microtopography that is characteristic of natural wetlands. In addition, there may be differences in microtopographic patterns depending on creation methods (i.e., absence or presence of

disking).

In the proposed study, we will quantify microtopography at three created wetlands with varying ages (i. e., 1-2 year old, 4-6 year old, and 10-12 year old) and a reference (i.e., natural) wetland (> 40 year old). All of the created wetlands were initially disked to introduce microtopography, thus providing an opportunity to examine how induced microtopography changes over the course of ecosystem development in created wetlands. One of the sites includes some areas undisked initially, which will allow investigation of the roles of initial disking as a creation method in functional development of created wetlands. We will use elevation data taken at a regular (10 or 20 cm) interval along multi-scale (0.5 m-, 1 m-, 2 m-, and 4 m-diameter) nested circular transects that will be placed at the sites. We will also evaluate vegetation community development and soil properties, and relate those to the quantified microtopographic variability.

The expected results will reveal how microtopography develops in a created wetland over time and how it relates to the development of vegetation community and biogeochemical functions that are often measured to evaluate the "success" of mitigation practices. The outcome of the study will also provide guidance on the correct "scale" at which microtopographic features should be incorporated in created/ restored wetlands. It may be too costly to reestablish microtopography across large created or restored sites in their entirety, so there is value in knowing a spatial scale of microtopography significant in ecological developments of wetlands. The information being garnered through our study will be useful for mitigating the losses of wetlands more effectively in the future, thus benefiting state agencies involved with wetland creation and restoration.
